1:Beals E-5 (1940-1941)1946 NU34 Tarasco NU34
Sierra Tarascans
La Cañada Tarascans

meat. At this time of year there may have been a few meals with immature squash or wild herbs from the woods, stewed with perhaps a little milk or cheese and lard.

Evelyn Payne Hatcher kindly consented to attempt an analysis of the diet of Cherán. The results are full of guesswork, but they are at least suggestive. The results show that if yellow maize was used almost exclusively, the diet of a wealthy family would contain no outright deficiencies and in many respects provide more than the usual recommended minimum amounts of various vitamins and proteins and calories. A very poor family, on the other hand, would show a striking deficiency in vitamin B_1 and an inadequate caloric intake. Both diets would give a marked deficiency of vitamin A if white corn were used instead of yellow corn. Despite the inadequacy of the data, there seems little reason to doubt that in some cases, particularly among poor families, deficiencies in the diet are sufficiently large to have a pronounced effect upon behavior and cultural participation (Beals and Hatcher, 1943).

COMPARATIVE NOTES

Some interesting comparisons are afforded by data from other towns. The most complete information was secured from Chilchota in La Cañada.

Chilchota is a Mestizoized Indian town, i. e., the bulk of the population is of Indian descent but a number of Mestizos have moved in, the native language is scarcely spoken any longer, and the people regard themselves as non-Indian. Customs are closely similar to those in the nearby Indian towns, however. Following are some menus collected by Silvia Rendón (for Cherán menus, see Beals and Hatcher, 1943):

Chilchota menus

Luncheons (taken about 10 or 11 a. m.; no breakfast in this case):

Average household:

Broiled beef
Boiled beans
Black atole
Chile sauce
Tortillas

9: Lasker D-5 (1948)1953 NU34 Tarasco NU34
Sierra Tarascans

no significant difference in head form as measured by the average cephalic index. Also, although facial breadth is characteristically wider in Mongoloids than in other peoples, the Indians of each sex in this series are not broader in the face than the Mestizos — either in respect to bizygomatic diameter or when this is taken as a ratio of the total facial height — or of the upper facial height. When it comes to stature, however, the Indians of both sexes tend to be shorter on the average than the respective Mestizos. A previous study indicates that differences in stature are found between individuals in the same series who had spent some of their formative years as temporary migrants to the United States and those who had remained in Mexico.[3] Such differences represent the effects of milieu. It is quite possible, therefore, that any variations in stature between so-called Indians and Mestizos are also due to factors in their conditions of life — especially diet — rather than to any inherited racial differences between the two groups.

Most of the traits which would be expected to distinguish American Indians from Europeans are descriptive attributes which have been counted rather than measured. Among these are dark brown eyes, black hair, straight hair, prominent cheek bones (malars), and markedly concave front teeth (shovel-shaped incisors). These traits are in fact slightly more common in the Indians than in the Mestizos (See figures 1-5). Among males, all five of these characteristics are found in 33 per cent of 97 Indians, but they also occur in 19 per cent of 100 Mestizos. The only males to lack all five factors are four of the 100 Mestizos. For the females the five characters are all found in 29 per cent of 55 Indians and in 21 per cent of 72 Mestizos. None of the females examined lacked all of these Mongoloid traits. As far as these particular features are concerned most of the members of the community, whether regarded as Indians or not, show some Indian characteristics.

There are other conditions which are considered Mongoloid. A fold of the upper eyelid which covers the inner corner of the free lash-bearing margin (internal epicanthic fold) is one of them. General deficiency of facial and bodily hair is another such trait. Jutting of the teeth (prognathism) is a third. As will be seen in figures 6-8, however, neither eyefolds, mid-digital hair on the back of the fingers, nor prognathism differentiates Indians from Mestizos in this group of Mexicans.

A higher proportion of the persons categorized as Indians falls in the older age groups. As some traits are affected by age, it is necessary to make allowance for this factor. For instance, eyefolds tend to shift from internal to external types with age; yet age by age in this series similar proportions of the various types are found in Indians and Mestizos.

[3] Gabriel W. Lasker, "Environmental Growth Factors and Selective Migration," Human Biology, 24: 262-268 (1952).

10:Beals & Hatcher E-4,5 (1941-1942) 1943
NU34 Tarasco NU34
Sierra Tarascans

101 The village of Cherán is primarily an agricultural village, at an elevation of approximately 8500 feet, in the mountains between Pátz-
511 cuaro and Uruapan, Michoacán, México. The climate consequently is temperate. In comparison with other villages of the region, Cherán is relatively prosperous and it is probable that the diet is better than in the majority of Tarascan towns. In terms of Tarascan standards, probably only between ten and twenty percent of the population is to be classed as "poor". On the other hand, there are no markedly wealthy families.

Three methods of collecting data were used. One, followed pri-
126 marily by Sra. Rendón, was the collection of a complete list of foods eaten and the compilation of a large number of menus of actual meals for as many families as was possible. In addition, the entire staff collected recipes for specific dishes. These, although of ethnographic interest, were of little use in the present study. Finally, the cooperation of a number of literate families was enlisted to get a complete record
124 of the food consumed over a fifteen day period.

The final method naturally was the most valuable. Unfortunately, the number of cooperating families was small. Moreover, the accuracy of the returns probably varied considerably. In many cases, the amount of money spent was given rather than the quantity purchased but, as very detailed studies of prices had been made it was possible to equate prices and quantities with some accuracy. One considerable source of error is the amount of vegetables such as cabbage, greens, and so on gathered from gardens or from woods. In addition, a certain amount of fruit or "snacks", purchased in the market or from street vendors had to be estimated from knowledge of general habits. The most specific records covered only a period in the late Fall and do not take into account some slight seasonal variations in the diet. Despite all these deficiencies, the various types of data seem to point to the same general conclusions, and we believe that these are reasonably valid
146 if the specific results are viewed with proper reserve.
262 An average weekly diet for a Cherán adult is presented in table I.[2]

114 in 1941-1942. The study formed a part of the Program of Anthropological Investigations among the Tarascan Indians, a joint enterprise of the University of California, the Escuela Nacional de Antropología, the Instituto Nacional de Antropología e Historia, and the Departamento de Asuntos Indígenas. Analysis of the data was made by the junior author, Evelyn Hatcher.

128 [2] In compiling the tables, the following sources were used: Chatfield
113 and Adams, **Proximate Composition of American Food Materials**, United States Department of Agriculture Circular N° 549, 1940: Chatfield and McLaughlin, **Proximate Composition of Fresh Fruits**, United States Depart-

10:Beals & Hatcher E-4,5 (1941-1942) 1943
NU34 Tarasco NU34
Sierra Tarascans

TABLE 1

	onzs.	*I.U. A*	*I.U. B_1*	*mg. C*	*mg. B_1*	*onzs. proteins*	*onzs. fats*	*Calories*
maize	148	18,200	2,150	—	1.5	14.8	6.36	15,629
meat (beef)	8	40	90	4	.13	2.5	1.6	500
cheese	2	1,120	9	—	.32	.36	.64	223
beans	3.5	27	50	0	—	.77	.05	350
milk	8	350	38	5	.30	.14	.16	155
cabbage	2	30	14	8	—	.03	0	16
chile	1.5	1,320	—	81	—	—	—	—
oranges	4.5	70	35	40	.12	.94	0	65
bananas	5	230	28	23	.07	.06	0.01	140
pears	3.5	6	5	3	.02	.02	.01	68
sugar	1	—	—	—	—	—	—	113
fish	1	200	20	0	.1	.25	—	200
greens	6	1,000	30	40	—	.24	—	70
Totals		22,593	2,469	204	2.56	19.21	8.83	17,529

Diet of one adult for one week, an average of the diets given.
I. U.: International Units.
mg.: milligrams.

146
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10:Beals & Hatcher E-4,5 (1941-1942) 1943
NU34 Tarasco NU34
Sierra Tarascans

146 This table is an abstraction derived from all the different sources of information. It shows that the diet contains somewhat more than 262 minumum requirements of vitamins A and B1, slightly less than minimum requirements of vitamin C, and appreciable deficiency of vitamin B_2, ample proteins, and nearly a 25 percent deficiency in calories. 556 511

Such an average diet obviously is not very meaningful in giving the extremes. Fortunately, the two best fifteen day schedules secured were respectively from one of the wealthiest families in town and from one of the poorest. Table 2 shows the analysis of the diet for one week of an adult belonging to the wealthiest family.

The results of table 2 show a number of interesting and important points. While the vitamin A intake is above the minimum requirements (although still far below optimum recommendations), virtually all the vitamin A comes from yellow maize. If white maize were to be consumed, the vitamin A intake would be dangerously reduced. When it [184] is remembered that in some sections of Michoacán, white maize is preferred, it is evident that if the diets are at all similar to those at Cherán, serious vitamin A deficiency must occur. This is almost certainly the case, as diets of most Tarascan and many rural Mexicans in the area are little different from those in Cherán. The wealthy diet shows an approach to the higher recommended quantities of vitamin B_1, but vitamin C does not quite reach the minimum, and vitamin B_2 is still only about half the minimum needed. The protein intake is quite high and the calory intake is slightly above the recommended minimum for moderately active males. Table 2 is arranged to emphasize the importance of maize in the diets of even the wealthy.

Turning to the diet for a very poor family, analyzed in table 3, the vitamin A intake is slightly above minimum requirements, although again the figures depend upon the use of yellow maize. Vitamin B_1 intake is well below minimum requirements, and is only about half of the recommended quantity. Vitamin C, on the other hand, shows up much better than in the wealthy diet, due to the greater use of chile. If this is typical of poor family diets, then the vitamin C intake of poorer people is almost twice the minimum requirements, although

128 ment of Agriculture Circular N° 50, Revised 1931; Stiebeling and Phipard, **Diets of Families of Employed Wage Earners and Clerical Workers in Cities**, United States Department of Agriculture Circular N° 507, 1939; Daniel and Munsell, **Vitamin of Foods**, United States Department of Agriculture Miscellaneous Publication 275, 1937; Borsook, **Vitamins**, Viking Press, 1940; Booher and Hartzler, **The Vitamin B Content of Foods**, United States Department of Agriculture Technical Bulletin N° 707, 1939: and Fixen and Roscoe, **Table of Vitamin Contents**, Nutrition Abstracts and Reviews, 9, 795 (1940).
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TABLE II

	onzs.	*I. U. A*	*I. U. B_1*	*mg. C*	*mg. B_2*	*onzs. proteins*	*onzs. fats*	*Calories*
meat	10.4	52	117	5.7	.16	1.9	1.35	875
cheese	1.6	900	7	—	.25	.37	.52	179
bread	1	70	30	0	—	.1	.02	100
bananas	5.5	230	28	7	.07	.66	.11	154
milk	16	700	75	10	.60	.28	.32	310
lard	.5	—	—	—	—	—	H.5	127
beans	5	40	71	0	—	1.1	.08	495
oranges	12	117	100	107	.32	.11	.02	175
fish	1	200	20	0	.1	.25	—	200
greens	6	1,000	30	40	—	.24	—	70
chiles	.7	616	—	38	—	—	—	
Totals (without maize)		3,835 [1]	433	207.7	1.50	5.01	2.42	2,685
maize (yellow)	192	23,600	2,840	—	2.07	19.2	8.26	20,280
Total		27,585	3,318	207.7	3.57	24.21	10.68	22,965
Minimum requirements.		21,000	2,331	210	6.3	11.2	—	—
Recommended		42,000	3,500	525	12.6	15	—	21,000

Diet of one adult for one week, wealthy family.

[1] This would be the quantity of vitamin A with white maize.

146
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511
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10:Beals & Hatcher E-4,5 (1941-1942) 1943
NU34 Tarasco NU34
Sierra Tarascans

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TABLE III

	onzs.	*I. U. A*	*I. U. B_1*	*mg. C*	*mg. B_2*	*onzs. proteins*	*onzs. fats*	*Calories*
maize	121	14,890	1,750	—	1.2	12.1	5.2	12,780
chiles	7.5	6,600	—	400	—	—	—	75
beans	1.5	10	33	—	—	.33	.02	250
cheese	2	1,120	9	—	.32	.36	.64	223
greens	3	500	15	20	—	.12	—	35
Totals		23,120	1,807	420	1.52	12.91	5.86	13,363
(with white maize)		8,230	—					
Minimum requirements.		21,000	2,331	210	6.3	11.2	—	—
Recommended		42,000	3,500	525	12.6	15	—	21,000

Diet of one adult for one week, very poor family.

10:Beals & Hatcher E-4,5 (1941-1942) 1943
NU34 Tarasco NU34
Sierra Tarascans

still short of what is recommended by some authorities. With vitamin B_2, however, the deficiency again becomes marked. Protein intake is barely above the minimum, while less than two thirds the minimum number of calories is secured.

The figures given in these tables, and the difficulties which arose in securing them, point out serious problems in the development of an accurate measure of diets. As the junior author has remarked, "I don't believe any of the values I found, and I don't believe the results I got. The whole business consists of a series of estimates. The actual figures in the tables mean little, but the fact that, in spite of whatever contortions I put the data through, I came out with something similar, gives plausibility to the general results." The reasons for this situation lie only partly in the inadequacies of the data; even greater uncertainty results from the difficulty of applying the published results of vitamin assays directly to specific foods prepared in specific ways. Thus in the case of the crucial vitamin C values, which in poor diets is almost wholly derived from chile, the variation in the C content of different varieties, and the variable losses in cooking and storage of each of these varieties under specific conditions makes an accurate estimation very difficult. In the case of maize, there is apparently no information as to the effect of storage and preparation on the vitamin A and vitamin B_1 content. As Mills has pointed out, there is also a difference in the vitamin content of foods produced in different regions.[3] We have no way of knowing whether corn produced in Michoacán, for example, has the same vitamin content as the corns analyzed in the United States. Finally, one may raise the all important and hitherto completely unanswered question as to whether nutritional requirements are the same for all peoples.

Nevertheless, some suggestions emerge from the studies. First of all, it is clear that the basic field data must be collected with great accuracy and with refernce to specific foods. The work of Steggerda[4] in Yucatán, for example, could not be compared with the results in this paper simply because a large number of foods were lumped together, rendering any effort at vitamin analysis impossible. This also applies to general statements about the importance of individual foods to diets. Ralph Linton, for example, has recently suggested that the increased protein intake resulting from the domestication of the bean,

[3] Mills, C. A. "Climatic Effects on Growth and Development, with Particular Reference to the Effects of Tropical Residence" (American Anthropologist, 44: 1-13, 1942).

[4] Steggerda, Morris. "Maya Indians of Yucatán". Carnegie Institution of Washington, Publication 531.

10:Beals & Hatcher E-4,5 (1941-1942) 1943
NU34 Tarasco NU34
Sierra Tarascans

121 [114] made possible the dense populations necessary for developing the more advanced Middle American cultures.[5] Yet when we analyze actual intake of foods among a people who undoubtedly were part of the advanced culture groups, we find that the protein intake from beans [146] in a wealthy family is only 1.1 ounces per adult per week, and in a poor family 33 ounces per week, while the protein intake from maize is respectively 19.2 ounces and 12.1 ounces per week. It is true that the quality of protein may be a factor of significance, particularly with reference to presence or absence of amino acids, but again no very satisfactory data are available. Finally, it is evident that much more work must be done in determining the values of foods, particularly with respect to the vitamin content of foods grown in the Tarascan environment. There must be further studies of the effects of maize storage, chile drying, and the specific effects of Tarascan cookery methods upon specific foods, to mention but a few problems.

128 146 One additional method of checking the validity of the present results is possible. The vitamin picture does suggest certain clinical and sub-clinical deficiencies. Persons using white corn in this area should show a high incidence of night blindness, some xerothalmia among children, and retarded growth. The B-vitamin picture is everywhere low, markedly so among low income groups. Consequently, there is expectation of pellegra, lack of vitality, and digestive disorders such as constipation. Scurvy probably should occur at times if the results are more or less correct. All of these dire predictions could be checked by good medical field studies; if verified, the reliability of the present study would be considerably enhanced. The probability that vitamin B deficiencies affect vitality indicate the importance of further studies to determine possible influences on culture development or cultural participation.

146 As a final comment, the Cherán diet would be greatly improved by a shift in emphasis upon items already present. More whole wheat, bread, sweet potatoes, oranges, bananas, milk, tomatoes, meat and eggs, and less maize, would produce a distinctly better diet. Table 4 is a modification of the diet for a very poor family, showing what a great change would be produced by rather slight shifts which could be accomplished with little or no increase in cost. The increase in vitamin intake, however, would still leave a deficiency of the vitamins and reduce the calory intake still more.

262 435 Analysis of the costs of various diets reveals much more striking differences than are shown by the nutritive values. Data from one of

[5] Linton, Ralph. "Crops, Soils, and Culture in America" (in The Maya and their Neighbors, New York, 1940, pp. 32-40).

[text continues on p. 304]

10:Beals & Hatchet E-4,5 (1941-1942) 1943
NU34 Tarasco NU34
Sierra Tarascans

TABLE IV

	onzs.	*I. U. A*	*I. U. B_1*	*mg. C*	*mg. B_2*	*onzs. proteins*	*onzs. fats*	*Calories*
maize (yellow)	91	11,170	1,400	—	1.0	9.0	4.0	9,645
sweet potato	21	24,000	150	60	—	.38	.15	840
whole wheat bread . .	4	280	120	—	—	.4	.16	400
cheese	2	1,120	10	—	.32	.36	.64	223
beans	1.5	10	30	20	—	.33	.02	250
greens	3	500	15	20	—	.12	—	35
chile	5	4,400	—	265	—	—	—	50
milk	3.5 pints	2,450	260	35	2.1	.98	1.12	1,085
Totals		43,790	1,985	400	3.42	11.57	6.09	12,528
Minimum requirements.		21,000	2,331	210	6.3	11.2	—	—
Recommended		42,000	3,500	525	12.6	15	—	21,000

Sugested improved diet of one adult for one week. This is the Table 2, (very poor family) diet, substituting whole wheat bread, sweet potatoes and milk for some of the corn and chile.

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10:Beals & Hatcher E-4,5 (1941-1942) 1943
NU34 Tarasco NU34
Sierra Tarascans

262 the poorest families in town shows that the total food cost for a family
435 of three adults and two children could average as little as 81½ centavos a week or $42.38 (pesos) a year. This would be 16.3 centavos a day per person. In contrast to this, the diet of a relatively wealthy family, in which the household numbered ten persons, cost $12.50 per week or $650.00 per year. This would be $1.25 per person per week, or $65.00 per person per year, again disregarding age differentials.[6]

146 The suggested improved diet given in table 4 actually might cost
262 even less than the poor family diet presented. The diet in figure 4, is, however, deficient in calories, as has been stated. Even with the addition of sufficient calories, it is possible that the improved diet would not add noticeably to the cost; certainly it would not cost more than a peso a week for the five persons. These data suggest that education in the use of proper foods and the changing of food habits may sometimes be more important than economic betterment as a means of bringing about adequate nutrition.

121 It must be reiterated, however, that any conclusions suggested in this paper are tentative. Imperfect as the data and interpretations are, it is nevertheless clearly indicated that extensive and accurate nutritional studies are needed. This is true, whether the major aim is to discover the possible relation of nutrition to other cultural factors, or whether it is to map out a program of nutritional improvement for the group.

[6] In these cost estimates, it is assumed all food was purchased; actually some would be grown.